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Rescue system for rescuing persons who are in danger in  
high places

15 The present invention relates to a rescue system for  
persons who are in danger in high places, according to  
the preamble of patent claim 1.

20 Persons who are in danger in high places often have no  
way of rescuing themselves. Depending on the situation,  
there is a complete lack of appropriate means to permit  
this, or said means can often not be used to the degree  
necessary, or can often not be used at all for whatever  
reason.

25 A reason for this situation is, inter alia, the fact  
that rescue means or systems which may be available in  
some cases are dependent on location and/or power.  
Means or systems for rescuing persons who are in danger  
in high places which are independent of location and/or  
30 power often exhibit an inadequate degree of  
reliability.

35 For example, elevators should not be used in dangerous  
situations in high buildings as there is a risk of  
getting stuck. Staircases in or outside the building  
may become unusable due to fumes. Escape ladders are  
not provided everywhere by a long way and are more  
dangerous than outside staircases. Rescue lines for  
lowering oneself down are anything but safe, if they

are provided at all, and are certainly not suitable for untrained persons.

The present invention is therefore based on the object  
5 of making available a rescue system for persons who are  
in danger in high places and which ensures safe rescue  
while being simple to handle.

The object which is set is achieved by means of the  
10 technical teaching of patent claim 1.

If persons in high places are seriously in danger, they  
can rescue themselves by means of a special rescue  
system in the form of a rucksack-like belt system with  
15 built-in rescue parachute. In order to prepare for the  
rescue, the belt system must be put on. In order to put  
on the belt system it is necessary to slip one's legs  
and arms into the loops provided for them. An abdominal  
belt or chest belt must then be closed. After this, the  
20 rescue system is already ready for a rescue without  
restriction. The abdominal belt or chest belt is  
fastened in a receptacle on the belt system within each  
reach. This fastening is selected such that the closure  
clip of the abdominal belt or chest belt projects out  
25 of which receptacle and can be grasped satisfactorily  
and easily when the belt system has been put on.

This closure clip must be plugged in a known fashion  
into the associated belt securing means so that the  
30 abdominal or chest belt of the belt system is closed.  
When an attempt is made to plug the closure clip into  
the belt securing means, the abdominal or chest belt  
which has been arranged in the receptacle up to that  
point must inevitably be pulled out of its receptacle.

35 In turn, the closure of the receptacle for the  
abdominal or chest belt inevitably opens and the  
secondary parachute which is also deposited in it and

has the purpose of ensuring that the rescue parachute opens drops out automatically.

This secondary parachute is connected by means of a  
5 ripcord to the closure cover of the stowage space for  
the rescue parachute, said space being arranged on the  
rear of the belt system. The rescue parachute is  
located in this stowage space and is held in a hose  
10 container. The slight pull on the ripcord causes the  
closure cover of the stowage space to open and the hose  
container, with the rescue parachute stowed in it, to  
drop or slide out of the stowage space.

The rescue parachute is inserted into the hose  
15 container in such a way that it can easily be pulled  
out of it in a reliable way. The resistance of the  
secondary parachute is sufficient to do this, and is  
furthermore also suitable for releasing the closure  
cover from the belt system in all cases. In this  
20 respect, consideration has also been paid to the fact  
that in an emergency the person to be rescued may in  
certain circumstances fall head first from a height. In  
this case it is also ensured that the secondary  
parachute opens the closure cover in all cases and  
25 subsequently pulls the rescue parachute out of the hose  
container so that the latter opens in order to rescue  
the person in question.

In order to be able to open the rescue parachute  
30 reliably and without danger it is necessary for the  
person in question to jump from a height so that the  
resistance of the secondary parachute releases the  
closure cover by means of the ripcord, pulls the hose  
container out of the stowage space and pulls the hose  
35 container down and away from the rescue parachute. At  
this moment, the rescue parachute is free and fills  
instantaneously with air so the person to be rescued  
stops freefalling and changes over into a floating down  
movement using the rescue parachute, which movement the

person to be rescued can influence by means of steering maneuvers.

The person to be rescued can therefore basically jump

5 from a height immediately after the chest belt has been closed. It would be appropriate for the person to previously tighten the abdominal belt or chest belt suitably so that the belt system fits satisfactorily.

10 However, the function of opening the rescue parachute is already ensured from the time when the closure clip for the abdominal or chest belt is pulled, that is to say even before the abdominal or chest belt is closed, it being possible to assume that the person in question

15 will do this before he/she jumps from a height.

This description applies to a situation in which the person in question does not use some other device which is provided to open the rescue parachute more quickly.

20 In the previously described variant, a distance of approximately 20 m to 25 m has been determined for the freefalling distance in jump trials which have been carried out. This distance can be shortened by using further resources. It is thus provided for the person

25 in question, or even a further person, to attach a fastening loop, arranged on the ripcord, to a suitable anchoring means so that the freefalling distance up to the point when the necessary resistance is reached in order to open the closure cover is eliminated.

30 For this purpose a further resource is arranged. This is a snap action hook. This may be hooked into the fastening loop on the ripcord if necessary after said line has been wound around a suitable object to anchor

35 it. The snap action hook can logically also be anchored itself at a suitable location in order to open the closure cover immediately.

Irrespective of the manner in which the person to be rescued jumps or falls from a height, it is ensured in all cases that the rescue parachute is opened reliably and automatically. For this purpose, it is to be noted 5 at this point that basically even persons who have lost consciousness can be rescued from a high place by means of such a rescue system. The rescue system is designed in such a way that the rescue parachute opens in any circumstance regardless of the position in which the 10 rescue system is located, and the rescue parachute allows the load fastened to it to float downward at the appropriate falling speed.

If this load were an unconscious person, the only 15 problems encountered would be that the person cannot use appropriate steering movements to avoid obstacles which may appear, or may have a hard landing under certain circumstances. However, these problems are certainly acceptable in comparison with the risk of 20 possibly not surviving without the rescue system according to the invention. In this way the group of persons to be rescued would thus be extended even to persons who would no longer be in a position to save themselves for whatever reasons.

25 The ripcord to which the closure cover is fastened is positioned within the stowage space for the rescue parachute in such a way that the closure cover is torn open no matter how the belt system is orientated during 30 the freefall. This is achieved by virtue of the fact that the ripcord is looped in the interior of the belt system, that is to say in the stowage space for the rescue parachute, in such a way that it is permanently connected to the closure cover at least on one side and 35 is conducted freely approximately opposite or diagonally with respect to this fastening point. In the simplest case this is done within the stowage space. That is to say for example the side of the ripcord which is fastened to the closure cover lies on the

inside at the top when the person to be rescued is in an upright position, and the ripcord is in turn guided inside to the lower end of the closure cover and guided out of it. This ensures that the closure cover is 5 opened in all cases irrespective of whether the person to be saved jumps head first or legs first so that the hose container with the rescue parachute stowed in it is exposed and the rescue parachute can then slide out of the hose container and open.

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In summary it is possible to note at this point that in an emergency a ripcord which is located on the belt system which forms the safety system, or a rope/cable is securely mounted on an object or a suitable 15 anchoring in or on the building. A person can then jump from the building. After several meters, the parachute is pulled out of the belt system, in which case it can open immediately.

20 If the cord is not satisfactorily fastened to the building, the system will remain inoperative without further safety measures. However, this function of activating the parachute can be ensured by attaching a small parachute (braking parachute). The opening 25 mechanism for the rescue parachute then either remains hanging from the building, or alternatively floats down from it after the rescue parachute 11 has opened using the small secondary parachute 5.

30 In order to ensure the operativeness, a suitable closure, for example a touch and close fastener of a container is opened or disconnected as the abdominal and/or chest belt closes, after which a secondary 35 parachute for releasing the rescue parachute with the snap action hook and the fastening loop drops to the ground from the respective container and as a result the automatic rescue system is now also activated without further maneuvers.

Starting from this time it is ensured in all cases that the rescue parachute is opened when the wearer jumps or falls from a height. The system is primarily developed for a situation in which persons wish to rescue 5 themselves and in the stressful situation do not fasten the ripcord with the loop provided for it and/or with the snap action hook, for opening the rescue parachute as early as possible, or else do not fasten it correctly, or perhaps can no longer fasten it owing to 10 whatever circumstances.

The container in which the abdominal and/or chest belt is stowed together with the release mechanism of the rescue parachute can be composed of woven fabric, 15 plastic or the like. The closure of the container can be formed by means of a touch and close fastener, a zip fastener, pins or other closure possibilities. The container can also be composed of two or more shells which are plugged one into the other.

20 The release mechanism of the rescue parachute is composed essentially of the ripcord at one end of which a fastening loop is arranged.

25 Furthermore, there is a secondary parachute arranged on the ripcord which ensures in all cases that the rescue parachute is opened as the wearer jumps or falls from a height. Furthermore, a snap action hook is arranged on the ripcord in order to facilitate anchoring the 30 ripcord. Furthermore, the ripcord is connected to the closure cover of the rescue system in the form of the belt system behind which the hose container is inserted, for example, in a zigzag fashion, and in which the rescue parachute is held.

35 By means of a pull on the ripcord, the closure cover is therefore opened or pulled off so that the closure container with the rescue parachute located in it slips out of the belt system. The pull on the ripcord is then

of such a magnitude in all cases that the rescue parachute slips out of the hose container and opens so that the person to be rescued hangs in the rescue parachute and floats safely to the ground.

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The rescue device, that is to say the rescue parachute, which may then either be a conventional round cap or a controllable parachute, is packed in a hose form and pulled into its hose container. The attachment lines of 10 the parachute are accommodated in the hose container. The rescue device and the hose container are then packed into the belt system using a zigzag method, and closed with the closure cover.

15 In a normal situation, the fastening loop is fastened in the building or about a component which is fixedly fastened to the building. The fastening may be carried out by inserting a table leg or wrapping cord around the table leg, using the snap action hook for securing 20 purposes. The person can then jump out of the window, door or off the roof etc.. In the process, the ripcord is tightened and the closure cover disconnected from the belt system. The lid then in turn pulls out the hose container together with the parachute. It then 25 pulls the parachute completely out of the hose container and the parachute can unfold. The release mechanism with fastening loop, braking parachute, snap action hook, closure cover and hose container always remain one unit and remain together by virtue of the 30 connection to the ripcord.

The secondary parachute has a function of pulling the rescue parachute out of its hose container (packing bag) when the ripcord is not inserted, or when it 35 becomes detached from the securing point or fastening point of this secondary parachute.

The secondary parachute may be of any conceivable shape, the decisive factor is that as the acceleration

increases, a resistance is generated which is so large that this component generates sufficient force to open the closure cover and expose the main parachute.

- 5 If the attachment loop should become loose or if it was not securely connected to the building, the person to be rescued would fall in an unbraked fashion. In this situation, the secondary parachute which increases its force at every meter of the drop until it opens the
- 10 closure cover then acts and pulls out the hose container. This opening method is based on air resistance and therefore requires neither a battery, altimeter or any additional resources.
- 15 The parachute is preferably a Rogallo system which can additionally be controlled by pulling the lines. The parachute therefore always moves away from the jumping location.
- 20 The packing method is configured such that the hose container is pulled over the rescue parachute, and the hose container is then packed into the belt system using a zigzag method.
- 25 The present invention will now be explained in more detail below with reference to the appended drawings. Further individual details on said invention are disclosed by means of the description of the individual figures. In the drawing:
- 30 Figure 1 shows a plan view, from behind, of the rescue system according to the invention or else safety system in the form of a belt system on which a rescue parachute is also accommodated
- 35 on the wearer's back;

Figure 2 shows the release mechanisms for the rescue parachute;

Figure 3 shows the rescue system which has already partially been put on by a person, with the main emphasis on the safety mechanisms;

5      Figure 4 shows the rescue system which has been put on by a person, in a rear view;

Figure 5 shows a rear view of the rescue system in which the chest belt has not yet been closed;

10     Figure 6 shows a side view of the rescue system in which the chest belt has also not yet been closed;

15     Figure 7 shows an oblique front view of the rescue system in which the chest belt has just been put into position for closing, the necessary objective on the chest belt exposing the safety mechanism for the rescue parachute;

20     Figure 8 shows the closing of the chest belt and of the rescue system with exposed safety mechanism for the rescue parachute;

25     Figure 9 shows the tightening of the chest belt for the rescue system;

Figure 10 shows the rescue system in a state in which it has been put on by a person, with an exposed safety mechanism for releasing the rescue parachute;

30     Figure 11 shows the fastening of the safety mechanism for the earliest possible release of the rescue parachute of the rescue system;

35     Figure 12 shows a loop of the safety mechanism which is closed by a snap action hook and a loop, in an exemplary view;

5       Figure 13 shows a person who has put on the rescue system according to the invention, the release mechanism having been fastened around a possible anchor according to Figures 11 and 12;

10      Figure 14 shows the person jumping from a height, the release mechanism pulling the rescue parachute out of the rescue system which the person has put on in order to intercept the freefall;

15      Figure 15 shows the person with the rescue parachute opened;

20      Figure 16 shows a further variant of the opening of the rescue parachute of the rescue system according to the invention in which, in accordance with Figure 14, the rescue parachute is also in the process of being pulled out of the rescue system, and

25      Figure 17 also shows the person to be rescued with the rescue parachute opened, but as a result of the release of the rescue parachute using the secondary parachute.

30      Figure 1 shows the rescue system according to the invention in the form of the strap system 9 which is composed of a back part in which, in an application-related situation, a rescue parachute is held in an appropriately prepared state, which back part is closed by means of a closure cover 8. In order to be able to 35 put on the strap system 9 appropriately, it has shoulder and arm straps 18 as well as leg straps 17. The hip strap is arranged in the lower region. The rescue system or else safety system in the form of the strap system 9 is then put on in such a way that the

wearer climbs into the two leg straps and the two shoulder and arm straps are crossed over in a manner of a harness so that the strap system 9 itself comes to rest on the back in the manner of a safety harness, the 5 legs and arms of the body of the person to be rescued being inserted in the respective receptacles. In order to close the system it is necessary to anchor the abdominal/chest strap 1 to the closure clip 12 in the strap securing means 13 in such a way that the 10 abdominal/chest strap comes to rest just before the abdomen or the chest. Said strap can then be tightened, if necessary.

In order to plug the closure clip 12 into the strap 15 securing means 13 it is necessary to pull the abdomen/chest strap 1 out of its receptacle 3 which may also be, for example, in the shape of a container as the abdomen/chest strap is inserted into this receptacle in such a way that only the closure strap 12 20 projects out of it at one point. When the wearer pulls on the abdomen/chest strap, the receptacle for the abdomen/chest strap is then opened or its cover removed so that a safety mechanism or release mechanism for the 25 rescue parachute is exposed and drops out of the receptacle.

Starting from this time it is already ensured that the 30 rescue parachute is opened when the wearer jumps or falls from a height.

The ripcord 4, which is part of the release or safety mechanism for the rescue parachute, is inserted, for the most part, into the receptacle 3 together with the abdomen/chest strap, using the appropriate means. As 35 soon as the abdomen/chest strap is removed from the receptacle 3, the major part of the release or safety mechanism located in it drops out of the receptacle 3 so that, as is clearly apparent in Figure 10, said mechanism is then exposed. The remaining part of the

ripcord 4 which is not accommodated in the receptacle 3 runs outside the receptacle 3 to the rear side of the strap system 9 and is securely connected to the closure cover 8. By means of a pull on the ripcord 4, the 5 closure cover 8 is disconnected from the strap system 9 so that the hose container 10 arranged under it, with the rescue parachute 11 arranged in it slips out. A further slight pulling effect on the ripcord causes the 10 hose container 10 to be pulled off from the rescue parachute 11 so that the latter can be used immediately.

Figure 2 shows the release or safety mechanism for the rescue parachute. The latter is composed essentially of 15 the ripcord 4 which has a fastening loop 7 at one end. This fastening loop can be optionally wound around any anchor. If it is not possible to fasten the fastening loop 7 anywhere on its own, a snap action hook 6 is additionally arranged on the ripcord 4 in order to 20 permit the ripcord 4 to be fastened, which snap action hook 6 can be used, together with the fastening loop 7, to form a noose which can be laid around any object or anchor. The example of a corresponding illustration can be found in Figures 11, 13 to 15. In these figures, a 25 table leg has been illustrated as an appropriate counter bearing or anchor. Figure 12 shows how the snap action hook 6 can be connected to the fastening loop 7 in order to form a noose which can be laid around a suitable anchor.

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Figure 3 shows the rescue system according to the invention in the form of the strap system 9 in an oblique side view from below. It is important here that the receptacle 3 is illustrated in such a way that part 35 of the chest strap 1 is arranged in the receptacle 3 in such a way that only a short end projects out of it, to which short end the closure clip 12 is fastened. In order to be able to click the abdominal/chest strap 1 with the closure clip 12 into the strap securing means

13, it is necessary to pull on the abdominal/chest strap 1 so that the touch and close fastener illustrated in this case is opened as a closure of the receptacle or of the container 3. As a result, the 5 receptacle or the container 3 in which the major part of the ripcord 4 with the remaining part of the release mechanism for the rescue parachute is accommodated, also opens so that said parts drop out and are exposed, as illustrated in Figure 10. However, in the 10 illustration in Figure 3, these accessories are still accommodated in the receptacle 3 as prepared.

Figure 4 shows the rescue system according to the invention in the form of the strap system 9 in the view 15 from behind when a person has put on such a strap system. Here, the closure cover 8 on the strap system 9 can be seen anchored in the centre of the back.

The figure also clearly shows the part of the ripcord 4 20 which extends away from the receptacle 3 to the closure cover 8 which is fastened to the ripcord 4. It is also possible to see the abdominal/chest strap 1 which, according to the illustration in Figure 3, is still accommodated in the receptacle 3 before the person who 25 is wearing the strap system pulls it out of the receptacle and thus releases the release mechanism for opening the rescue parachute.

Figure 5 shows the situation in Figure 4 again, but 30 here an oblique side view from the rear is illustrated so that the receptacle 3 with the abdominal/chest strap 1 hanging out of it and the ripcord 4 projecting out of it can be seen more satisfactorily, as has just been described in the function with respect to Figure 4.

35

Figure 6 shows in turn the same situation but viewed directly from the side from below. Here it is very clearly apparent that the closure in the form of the touch and close fastener 2 for the receptacle 3 is

still in fact holding the receptacle to be closed, and the abdominal/chest strap 1 and the ripcord 4 at its rear end project out in the short way intended, as is provided for the preparation for use. The closure clip 5 12 hangs down from the abdominal/chest strap 1.

Figure 7 then shows the process in which a person to be rescued has removed the abdominal/chest strap 1 from the receptacle 3, the closure in the form of the touch 10 and close fastener 2 being released from the receptacle or the container 3 and hanging downward at the end of the abdominal/chest strap in the vicinity of the closure clip 12.

15 Here, it is important to note that the receptacle 3 is then opened so that the release mechanism for the rescue parachute composed of the ripcord 4 and having the fastening loop 7, the secondary parachute 12 and the snap action hook 6, is then exposed and lies, for 20 example, on the ground. Starting from this time, it is ensured in all cases that when the wearer jumps or falls from a height the rescue parachute is pulled out of the strap system 9 and opens. The dropping of the release mechanism for the rescue parachute is 25 illustrated by means of the arrow 16, and it takes place simultaneously with the movement of the person for the exposure of the abdominal/chest strap, illustrated by the arrow 15.

30 In accordance with Figure 8, the person to be rescued then closes the abdominal/chest strap by plugging the closure clip 12 into the strap securing means 13. The release mechanism for the rescue parachute lies next to the person and hangs down from the strap system 9, on 35 the closure cover 8 (shown in Figure 7) at the rear of the person to be rescued.

Figure 9 illustrates how the abdominal/chest strap can be tightened if necessary. Here, the closure clip 12

has previously been clicked into the strap securing means 13 so that the abdominal/chest strap 1 is correspondingly positioned around the abdomen or the chest of the person to be rescued. From this point in 5 time, the person to be rescued can jump or fall from a height and it is ensured in all cases that the rescue parachute will open. This is the case even if the person to be rescued is not completely conscious.

10 Figure 10 shows the situation according to the illustration in Figure 9 in which the person to be rescued has tightened the abdomen/chest strap, it being clearly shown here that the release mechanism for the rescue parachute is composed essentially of the ripcord 15 4 and has the fastening loop 7, the secondary parachute 5 and the snap action hook 6.

Figure 11 shows the variant in which the person to be rescued still has sufficient time either just to thread 20 the fastening loop 7 under a table leg or, as illustrated in Figure 11, form a loop, formed according to the illustration in Figure 12, by wrapping the fastening loop 7 around the table leg and clipping the snap action hook 6 into said fastening loop 7.

25 Figure 13 shows a situation of the person to be rescued, the loop having already been fastened around the table leg and the person standing on a wall projection before jumping down.

30 Figure 14 shows a situation after the person has jumped from a height. The ripcord 4 becomes taut, tears the closure cover 8 from the rear of the strap 9 and pulls the hose container 10, also attached to the ripcord 4, 35 out of the stowage space 14 of the strap system 9 so that the rescue parachute 11 slips out of the strap system 9 from its state in which it is folded up in a zigzag shape. In Figure 14 it is shown that the hose container 10 is already slipping down from the rescue

parachute 11 so that the latter is then exposed in order to catch the person jumping from a height. This state is illustrated in Figure 15.

- 5 Figure 15 shows that the hose container 10 has released the rescue parachute 11 and the person to be rescued then floats down from a height on said rescue parachute 11.
- 10 Figure 16 then shows the variant in which the person to be rescued has either failed to fasten the ripcord about any anchoring means or this anchoring operation was not carried out sufficiently well so that when the wearer jumps from a height the secondary parachute 5
- 15 inflates and exerts a pull on the ripcord 4 so that the closure cover 8 is torn off the rear side of the strap system 9, after which in turn, as already described in the previous embodiment, the hose container 10 is pulled out of the stowage space 14 of the strap system
- 20 9, in which case only the cords of the rescue parachute 11 can then also be seen here.

In the illustration in Figure 17, the person has then been brought to such a safe position, also by virtue of 25 the opened rescue parachute, that said person can now float to the ground. In this variant of the rescue means it has been shown experimentally to take approximately two seconds until the rescue parachute 11 has opened and caught the person in their freefall. The 30 release mechanism of the ripcord 4, secondary parachute 5, closure cover 8 and hose container 10 floats downward in this case on the secondary parachute 5. In the process which was previously described, this device remains hanging from the anchoring means.

Key to drawings

1. Abdominal/chest strap
2. Touch and close fastener
3. Receptacle for container
4. Ripcord
5. Secondary parachute
6. Snap action hook
7. Fastening loop
8. Closure cover
9. Strap system
10. Hose container
11. Rescue parachute rescue system
12. Closure clip
13. Strap securing means
14. Stowage space
15. Direction of arrow
16. Direction of arrow
17. Leg strap
18. Shoulder and arm strap
19. Hip strap
20. Release mechanism